<u>IN THE CLAIMS</u>

Please amend claim 19 as follows:

A1

19. (Amended) A method of improving mass resolution in time-of-flight mass spectrometry by compensating for an initial velocity distribution of ions to at least second order comprising:

a) applying a potential to a sample holder;

b) applying a potential to a first element spaced apart from the sample holder which, together with [a] <u>the</u> potential on the sample holder<u>,</u> defines [an] <u>a first</u> electric field between the sample holder and the first element;

c) ionizing a sample proximately disposed to the holder to form sample ions;

d) applying a second potential to either the sample holder or the first element at a predetermined time subsequent to steps a) [and] <u>through</u> c) which<u>,</u> together with the potential on the first element, defines a second electric field between the sample holder and the first element, and

A1 Concl'd

which extracts the ions from the first element after the predetermined time; and

e) energizing an ion reflector spaced apart from the first element[.];

wherein the first and second electric fields and the predetermined time are chosen such that a flight time of extracted ions of like mass-to-charge ratio from the reflector to a detector will be independent to second order of the initial velocity.--

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A2

Please add the following new claims:

--26. The method of claim 1 wherein said method further comprises the step of:

energizing an ion reflector remote from said first region such that said ions from said first region are reflected toward said ion detector.

27. The method of claim 1 wherein said sample source is a conductive metal grid.

A2 cont'd

28. The method of claim 1 wherein said sample source is a dielectric surface.

29. The method of claim 1 wherein said sample source is a dielectric surface with a thin film coating.

30. The method of claim 1 wherein said sample source is a metal surface.

31. The method of claim 1 wherein said first region is bound on one end by said sample source and on the other end by a first electrode.

32. The method of claim 31 wherein said ions generated from said sample source have an initial velocity component perpendicular to said first electrode.

33. The method of claim 31 wherein said ions generated from said sample source have an initial velocity component parallel to said first electrode.

34. The method of claim 33 wherein said ions are continuously generated from said sample source.

A2 cont

35. The method of claim 31 wherein said ions generated from said sample source have an initial velocity component perpendicular to said first electrode and an initial velocity component parallel to said first electrode.

36. The method of claim 31 wherein said first electrode is a grid.

37. The method of claim 31 wherein said first electrode is a conductive plate having at least one hole.

38. The method of claim 31 wherein said first electrode is a conductive plate having a plurality of holes.

39. The method of claim 31 wherein said first electrode comprises a groove through the center of its surface for receiving said sample source.

40. The method of claim 1 wherein said ions have a non-isotropic initial velocity distribution.

41. The method of claim 1 wherein said ions are desorbed from a surface.

A2 cont

42. The method of claim 1 wherein said ions have an average initial velocity distribution not equal to zero.

43. The method of claim 1 wherein said ions have an initial velocity component perpendicular to said sample source.

44. The method of claim 1 wherein said ions have an average initial velocity component greater than zero.

45. The method of claim 1 wherein a voltage pulse is applied to said detector to increase the gain of said detector.

46. The method of claim 1 wherein said method comprises the further step of deflecting unwanted ions from the ion path to the detector.

47. The method of claim 1 wherein said generating is fast atom bombardment.

48. The method of claim 1 wherein said generating is matrix assisted laser desorption.

A2 cont'

49. The method of claim 1 wherein said generating is plasma desorption.

50. The method of claim 1 wherein said generating is secondary ion generation.

51. The method of claim 1 wherein said generating is electron bombardment.

52. The method of claim 1 wherein said method further comprises the step of employing an optimization method to determine optimum values for the first field and the ion accelerating field.

53. The method of claim 52 wherein said optimization method is Simplex optimization.

54. The method of claim 1 wherein said ions are generated from a DNA sample.

55. The method of claim 1 wherein said ions are generated from a protein sample.

A2 cont'

56. A time-of-flight mass spectrometer (TOFMS) for determining the mass to charge ratios of accelerated ions, wherein said TOFMS comprises:

a first region including a sample source disposed therein;

an ion reflector remote from the first region;

an ion detector remote from said ion reflector;

means for establishing a first field within said first region;

means for generating ions from said sample source;

means for establishing a second field within said first region at a predetermined time after establishing said first field; and

means for energizing said ion reflector;

wherein said second field accelerates said ions generated within said first region toward said reflector; and wherein said reflector reflects said ions toward said detector.

57. A TOFMS according to claim 56 wherein said first field is zero.

58. A TOFMS according to claim 56 wherein said first field is non-zero.

A2 cont

59. A TOFMS according to claim 56 wherein said sample source is a conductive metal grid.

60. A TOFMS according to claim 56 wherein said sample source is a dielectric surface.

61. A TOFMS according to claim 56 wherein said sample source is a dielectric surface with a thin film coating.

62. A TOFMS according to claim 56 wherein said sample source is a metal steel surface.

63. A TOFMS according to claim 56 wherein said first region is defined by a first grid juxtaposed with a second grid.

64. A TOFMS according to claim 63 wherein said TOFMS further comprises a second region defined by a third grid juxtaposed with said second grid.

65. A TOFMS according to claim 64 wherein a third field is established in said second region.

A2 cont

66. A TOFMS according to claim 63 wherein said ions generated from said sample source have an initial velocity component perpendicular to said second grid.

67. A TOFMS according to claim 63 wherein said ions generated from said sample source have an initial velocity component parallel to said second grid.

68. A TOFMS according to claim 67 wherein said ions are continuously generated from said sample source.

69. A TOFMS according to claim 63 wherein said ions generated from said sample source have a first initial velocity component perpendicular to said second grid and a second initial velocity component parallel to said second grid.

70. A TOFMS according to claim 63 wherein said second grid is a conductive plate having at least one hole.

A2 cont

71. A TOFMS according to claim 63 wherein said second grid is a conductive plate having a plurality of holes.

72. A TOFMS according to claim 63 wherein said first grid has a groove through the center of its surface for receiving said sample source.

73. A TOFMS according to claim 56 wherein said ions have a non-isotropic initial velocity distribution.

74. A TOFMS according to claim 56 wherein said ions are desorbed from a surface.

75. A TOFMS according to claim 56 wherein said ions have an average initial velocity distribution not equal to zero.

76. A TOFMS according to claim 56 wherein said ions have an initial velocity component perpendicular to said sample source.

77. A TOFMS according to claim 56 wherein said ions have an average initial velocity component greater than zero.

A2 cont'd

78. A TOFMS according to claim 56 wherein a voltage pulse is applied to said detector to increase the gain of said detector.

79. A TOFMS according to claim 56 further comprising a deflector to deflect unwanted ions from the ion path.

80. A TOFMS according to claim 56 wherein said means for generating said ions is fast atom bombardment.

81. A TOFMS according to claim 56 wherein said means for generating said ions is matrix assisted laser desorption.

82. A TOFMS according to claim 56 wherein said means for generating said ions is plasma desorption.

83. A TOFMS according to claim 56 wherein said means for generating said ions is secondary ion generation.

84. A TOFMS according to claim 56 wherein said means for generating said ions is electron bombardment.

85. A TOFMS according to claim 56 wherein an optimization method is employed to determine optimum values for the potentials and the predetermined times at which the potentials are applied.

A3 cont.

86. A TOFMS according to claim 85 wherein said optimization method is Simplex optimization.

87. A TOFMS according to claim 56 wherein said ions are generated from a protein sample.

88. A TOFMS according to claim 56 wherein said ions are generated from a DNA sample.

A2 cont.

89. A method of improving mass resolution in time-of-flight mass spectrometry, said method comprising the steps of:

applying a first potential to a sample holder;

applying a second potential to a first element spaced apart from the sample holder, wherein said sample holder and said first element defining a first region and wherein said first and second potentials define a first electric field in said first region;

ionizing a sample proximately disposed to the holder to form sample ions;

energizing an ion reflector spaced apart from the first element; and

changing the potential difference between the sample holder and the first element at a predetermined time which defines a second electric field between the sample holder and the first element to accelerate said ions from said first region toward said reflector;

wherein the first and second electric fields and the predetermined time are chosen such that the first and